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ENERGY LEVEL AND N SOURCE FOR FALL-CALVING COWS

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Fall calving looks promising and profitable for many ranch operators on high desert ranges (Raleigh, Turner, and Phillips, 1970). Light weaning weights, poor calving weather, and long breeding seasons have plagued ranchers with a spring calving program.

Energy requirements for wintering lactating cows are critical. The energy level must provide for lactation and conception requirements. However, excess energy is inefficient from the standpoint of economics as well as animal utilization. This excess energy can more efficiently be fed directly to the calf.

Nitrogen (N) requirements for wintering lactating cows have been fairly well established (National Research Council [NRC], 1963) however, we are continually looking for lower cost and better sources of N. With increasing human competition for vegetable proteins, the role of nonprotein nitrogen (NPN) in animal feeds has taken on added importance. Feeding urea with high roughage-low energy diets can create toxicity and palatability problems. Biuret 2/, in winter feeding rations and range supplements, has eliminated these problems (Turner and Raleigh, 1969; Raleigh and Turner, 1968).

The objectives of this study were to determine the minimal energy level necessary for wintering lactating cows, while providing for optimum production, and to evaluate biuret, urea, and cottonseed meal (CSM) as protein sources.

Experimental Procedure

In trial 1, 84 cow-calf pairs that were calved in October and November were stratified by age and production index of the cow, and age and sex of the calf to treatments. The study design was a 2 x 3 factorial with two levels of energy and three sources of N for the cows (table 1). Energy levels were calculated to provide for 85 and 100% of the recommended NRC (1963) requirements for lactating

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cows. Supplemental N sources were biuret, urea, and CSM, fed to provide the N level recommended by NRC (1963). Daily rations for the cows are presented in table 2. Water, salt, and a salt bonemeal mixture were available at all times.

Table 1. EXPERIMENTAL DESIGN

Source of N	Energy level Low a/	High a/	Number of animals
Biuret (38% N)	14 b/	14	28
Urea (42% N)	14	14	28
Cottonseed meal (6.55% N)	14	14	28
Number of animals	42	42	84

a/ The low level cow supplement was designed to provide for 85% of the recommended NRC (1963) energy requirements for lactating cows and the high level 100%.

b/ Number of cow-calf pairs per treatment.

Cows were moved off range in September 21, and put on rake-bunched hay. After calving, cows received 0.91 kg of barley and 0.45 kg of CSM daily until the initiation of the trial on January 8. The supplements were "hand-fed" about 8 am daily after which the animals were turned out in the fields for their daily hay ration.

Initial weights of the cows and calves were taken December 18, with the feeding regimes beginning January 8, and terminating with turnout date onto range April 11. Gain data were collected on calves periodically from birth to weaning to determine the long term effect of the winter treatments. All calves were creep-fed during the winter and summer periods.

The following year (trial 2) 102 cow-calf pairs, including 75 from the previous year's study, were allotted to the same experimental design, except a combination of biuret and CSM was used in place of the urea as a N source, with each providing 50% of the supplemental N. Cows were assigned to the same treatments as they were on the previous year, except cows on urea last year were reallotted to a CSM-biuret combination, but kept on the same energy level. New animals were stratified to treatment as described in trial 1.

Animals were handled the same as in trial 1, except they were on rake-bunched hay without supplements from September 1 to December 5, at which time the study was initiated. Initial weights were taken December 2, with feeding regimes beginning December 5 and terminating April 10. All cows were supplemented with 0.91 kg of barley and 0.45 kg of CSM from April 11 to turnout April 23.

Table 2. RATIONS FOR COWS a/

Ingredient	Low energy Amount fed	D.E.	C.P.	High energy Amount fed	D.E.	C.P.
	kg	kcal	kg	kg	kcal	kg
Hay b/	11.80	28080	0.95	11.80	28080	0.95
CSM	0.67	1927	0.27	0.34	990	0.14
Barley	-----	-----	----	1.14	3900	0.14
Fat	-----	-----	----	0.07	526	----
Total	12.47	30007	1.22	13.35	33496	1.22
Hay	11.80	28080	0.95	11.80	28080	0.95
Urea	0.08	-----	0.20	0.04	-----	0.10
Barley	0.56	1927	0.07	1.42	4890	0.17
Fat	-----	-----	----	0.07	526	----
Total	12.44	30007	1.22	13.33	33496	1.22
Hay	11.80	28080	0.95	11.80	28080	0.95
Biuret	0.09	-----	0.20	0.05	-----	0.10
Barley	0.56	1927	0.07	1.42	4890	0.17
Fat	-----	-----	----	0.07	526	----
Total	12.45	30007	1.22	13.34	33496	1.22

a/ Diets were as nearly isocaloric within energy levels as possible and isonitrogenous for all cows at a level recommended by NRC (1963).

b/ Hay was fed free choice and the figures presented are estimates based on past studies for average hay intake of mature cows.

Results and Discussion

In trial 1 calf gains from cows on the low level of energy were identical to those from cows on the high level (table 3), with each gaining 0.75 kg/day from December 18 to weaning. Calf gains from cows fed different N sources were not significantly different ($P > .05$). Calves from cows fed CSM gained 0.76, urea 0.74, and biuret 0.74 kg/day up through weaning, with winter gains of 0.66, 0.60, and 0.62 kg for CSM, urea, and biuret, respectively.

Weight changes of the cows were not affected by energy level with cows on each level losing 36 kg over the wintering period. Source of N had no significant effect on weight changes in the cow, even though those on the urea ration with the lower level of energy did not get onto full feed until the last month of the study. Toxicity and palatability problems associated with feeding urea in relatively low energy supplemental feeding regimes is the reason urea was discontinued as a N source in subsequent years of this study.

Table 3. CALF GAIN DATA FROM TRIAL 1

Cow treatment	No. of animals a/	12/18 wt b/	4/11 wt b/	Winter ADG	8/2 wt b/	Summer ADG	Total ADG
		kg	kg	kg	kg	kg	kg
High energy	41	63	135	0.63	230	0.84	0.75
Biuret	14	63	135	0.62	227	0.82	0.73
Urea	13	60	129	0.60	226	0.86	0.74
CSM	14	65	142	0.67	238	0.86	0.77
Low energy	40	64	136	0.62	232	0.86	0.75
Biuret	13	60	132	0.63	226	0.84	0.74
Urea	13	67	138	0.61	236	0.87	0.76
CSM	14	65	138	0.64	233	0.84	0.75
Nitrogen source							
Biuret	27	62	133	0.62	227	0.83	0.74
Urea	26	64	133	0.60	231	0.87	0.74
CSM	28	65	140	0.66	236	0.85	0.76

a/ Two cows and one calf died during the winter and were excluded from the study. Death was not considered to be due to treatments.

b/ 12/18 = initial weight, 4/11 = on range weight, 8/2 = weaning weight.

Conception rate over a 60-day breeding season was 95%. Four cows were open when pregnancy tested with 3 on biuret and 1 on CSM; and 3 on high and 1 on a low energy diet.

Table 4 presents calf gain data from trial 2 and shows small but nonsignificant (P>.05) differences between energy levels, with calves from cows on the high energy diet gaining 0.62 and 0.79 kg/day and the low energy 0.58 and 0.77 kg over the wintering period and on through to weaning, respectively. Calves from cows fed CSM gained 0.80, biuret-CSM combination 0.78, and biuret 0.77 kg/day up through weaning, with winter gains of 0.62, 0.60, and 0.60 kg for CSM, biuret-CSM combination, and biuret, respectively. These gains were not significantly different (P>.05).

Cows receiving high energy gained 6 kg while those on low energy lost 6 kg over the wintering period, with no difference between energy levels at weaning. No significant differences were found between N sources.

Conception rates for trial 2 were 69%. This was a drought year and conception rates were also low for the spring-calving herd. Equal numbers of cows were open between energy levels. Sixteen cows were open on biuret, 10 on biuret-CSM, and 7 on CSM. Calving date was not significantly (P>.05) different between any treatment.

Table 4. CALF GAIN DATA FROM TRIAL 2

Cow treatment	No. of animals a/	12/2 wt b/	4/23 wt b/	Winter ADG c/	7/29 wt b/	Summer ADG c/	Total ADG c/
		kg	kg	kg	kg	kg	kg
High energy	48	51	136	0.62	234	1.03	0.79
Biuret	16	52	139	0.63	232	1.03	0.78
Biuret-CSM	15	50	134	0.63	234	1.00	0.77
CSM	17	52	133	0.62	234	1.06	0.80
Low energy	51	54	133	0.58	232	1.04	0.77
Biuret	17	54	129	0.57	224	1.01	0.75
Biuret-CSM	17	53	132	0.57	234	1.05	0.78
CSM	17	54	139	0.62	240	1.07	0.80
Nitrogen source							
Biuret	33	53	134	0.60	227	1.02	0.77
Biuret-CSM	32	52	133	0.60	235	1.03	0.78
CSM	34	53	137	0.62	236	1.05	0.80

a/ Three calves died during the winter and were excluded from the study. Death was not considered to be due to treatments.

b/ 12/2 = initial weight, 4/23 = on range weight, 7/29 = weaning weight. These are actual weights with no adjustments for sex of calf.

c/ Average daily gains were adjusted for sex. Heifers were adjusted upwards to be comparable to the steers.

An interesting and unexplainable result over both trials is that calves from cows on high energy required significantly ($P < .01$) more treatment for scours, respiratory diseases, etc. than those on low energy. Source of N had no effect on calves requiring treatment.

Further studies are in progress and results to this point suggest the same trends as those reported here. Results to date indicate that the lower level of energy for the cows is the most economical, with price probably the most important factor in determining source of N. However, there are feeding problems with urea and these must be taken into consideration. Cows will continue on the same treatments in subsequent years to determine the long term effects of these treatments. Composition and level of creep for the calf is also being studied. Since animals were group fed their hay, and individual hay intake was not measured, it is possible that hay intake was reduced with the high energy level of feed.

Summary

Eighty-four cow-calf pairs that were calved in October and November were stratified by age and production index of the cow

and age and sex of the calf to treatments in a 2 x 3 factorial trial with two levels of energy and three sources of N for wintering fall-calving cows. The following year 102 cow-calf pairs were used with cows used previously allotted to the same treatment, except that a biuret-CSM combination was used in place of the urea treatment. Diets were isonitrogenous with N sources being CSM, biuret, and urea. Energy levels were calculated to provide 85 and 100% of that recommended by the NRC for lactating cows. Hay was fed free choice with daily supplements to provide the respective treatments. Average daily gains of the calves over the wintering period from mid-December to mid-April and from mid-December to weaning, August 1, were not significantly different ($P > .05$), with respect to treatments in either year. Daily gains through weaning, averaged over the two years were 0.74 and 0.75 kg for calves from cows on the low and high energy level, respectively, and 0.74, 0.73, and 0.76 kg, respectively, on urea, biuret, and CSM. Weight changes of the cows were not significantly ($P > .05$) affected by energy level or source of N, although cows on the low level of energy averaged 5.9 kg lighter following the wintering period. No significant ($P > .05$) differences were found for conception percent, calving percent, calving date, or weaning percent among any treatments. Results of this trial indicate that the most economical level to winter fall-calving cows is the low energy level with the cheapest source of N.

Literature Cited

NRC. 1963. Nutrient Requirements of Domestic Animals, No. 4. Nutrient Requirements of Beef Cattle. National Research Council, Washington, D.C.

Raleigh, R. J. and H. A. Turner. 1968. Biuret and urea in range cattle supplements. Proc. West. Sec. Am. Soc. Animal Sci. 19:301.

Raleigh, R. J., H. A. Turner, and R. L. Phillips. 1970. Production of fall-born vs. spring-born calves. Proc. West. Sec. Am. Soc. Animal Sci. 21:81.

Turner, H. A. and R. J. Raleigh. 1969. Biuret and urea for growing cattle. Proc. West. Sec. Am. Soc. Animal Sci. 20:331.